Paper No. 22

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte ARMAND P. TAILLON

Appeal No. 2003-0387
Application No. 09/772,275

ON BRIEF

Before COHEN, McQUADE, and NASE, Administrative Patent Judges.

NASE, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 1 to 6, which are all of the claims pending in this application.[1]

We REVERSE.

[1] Claim 1 was amended subsequent to the final rejection.

BACKGROUND

The appellant's invention relates to "three-piece" railroad car trucks, and more particularly to the four friction wedges that interface the bolster with the side frame and provide suspension damping and warp stiffness (specification, p. 1). A copy of the claims under appeal is set forth in the appendix to the appellant's brief.

Claims 1 to 6 stand rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 4,244,298[2] to Hawthorne et al. (Hawthorne).

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellant regarding the above-noted rejection, we make reference to the answer (Paper No. 16, mailed May 9, 2002) for the examiner's complete reasoning in support of the rejection, and to the brief (Paper No. 11, filed January 24, 2002) and reply brief (Paper No. 17, filed July 10, 2002) for the appellant's arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellant's specification and claims, to the applied prior art reference, and to the respective positions articulated by the appellant and the examiner. Upon evaluation of

[2] Issued January 13, 1981.

all the evidence before us, it is our conclusion that the evidence adduced by the examiner is insufficient to establish a prima facie case of obviousness with respect to the claims under appeal. Accordingly, we will not sustain the examiner's rejection of claims 1 to 6 under 35 U.S.C. § 103. Our reasoning for this determination follows.

In rejecting claims under 35 U.S.C. § 103, the examiner bears the initial burden of presenting a prima facie case of obviousness. See In re Rijckaert, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993). A prima facie case of obviousness is established by presenting evidence that would have led one of ordinary skill in the art to combine the relevant teachings of the references to arrive at the claimed invention. See In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988) and In re Lintner, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972).

The claimed subject matter

Claim 1, the only independent claim on appeal, reads as follows:

> A damping system for a rail car truck having a bolster, a pair of side frames, a plurality of friction wedges damping relative movement between the bolster and the side frames, and a side spring supporting each friction wedge, each friction wedge having a generally triangular shape with an angle θ being defined between a vertical friction surface and a sloping friction surface, the angle θ and the force P of each side spring being defined by the equations

$$Fw_{W.E}=\frac{-P}{2}\cdot\frac{\left(\cos(\theta)+\mu_{2w}\cdot\sin(\theta)\right)}{\left(\mu_{1w}\cdot\cos(\theta)+\mu_{1w}\cdot\mu_{2w}\cdot\sin(\theta)+\mu_{2w}\cdot\cos(\theta)-\sin(\theta)\right)}\cdot\frac{2\cdot a\cdot w_w}{\left[b\cdot\left(a+w_w\right)\right]}$$

$$V_{c.W.E}=2\cdot\mu_{1d}\cdot P\cdot\frac{\left(\cos(\theta)-\mu_{2d}\cdot\sin(\theta)\right)}{\left(-\mu_{1d}\cdot\cos(\theta)+\mu_{1d}\cdot\mu_{2d}\cdot\sin(\theta)+\mu_{2d}\cdot\cos(\theta)+\sin(\theta)\right)}$$

where:

$Fw_{W.E.}$ is the required warp friction force - worn - empty;
μ_{2w} is the slope warp coefficient - max;
μ_{1w} is the column warp coefficient - max;
a is the bearing centers;
b is the wheelbase;
w_w is the wedge [width];
$V_{c.[,/]W.E}$ is the maximum compression damping force per suspension - empty;
μ_{1d} is the column damping coefficient;
μ_{2d} is the slope damping coefficient.

The teachings of Hawthorne

Hawthorne's invention relates to improvements in three-piece freight car truck assemblies. In the Description of the Prior Art section, Hawthorne teaches that

> In a three-piece truck assembly, the side frames and bolster normally are square, i.e., the wheelsets and bolster (parallel to one another) are disposed normal to the side frames. Occasionally, however, at certain car speeds, the truck may become dynamically unstable, a phenomenon known as truck hunting, manifested by the truck going out of square or warping. The prior art teaches several ways of preventing truck hunting, e.g., the use of resilient side bearings, increasing warp stiffness, steering the wheelsets, the use of conconical wheel profiles, reducing lateral resistance, etc., and the literature has reported certain levels of warp stiffness achieved by three-piece truck assemblies. But numerous tests run to confirm the reported data show that warp stiffness of the levels reported by the literature cannot be achieved with known designs of three-piece freight car truck assemblies, and it appears that the reason for the lack of warp stiffness is instability of the wedges within the pockets.

Hawthorne then teaches in the SUMMARY OF THE INVENTION section that

> The principal object of the present invention is to provide a wedge system which is capable of achieving a warp stiffness high enough to elevate the critical speed of truck hunting (the speed at which hunting will first occur) to a level suitable for freight car operation.

Figures 1 and 2 show a typical freight car truck assembly having a pair of laterally spaced side frames 10 carried by a pair of wheelsets 12 and spanned by a bolster 14. Each side frame is provided with an opening 16 defined by a compression member 18, a tension member 20, and a pair of side frame columns 22. The opposite end portions of the bolster 14 extend respectively through the openings 16 and are carried respectively by spring groups 24 acting against side frame spring seats. A friction wedge 26 is carried by a spring 28 acting against the side frame spring seat to urge the wedge upwardly between the bolster and the side frame column. As the bolster moves vertically, the friction wedges slide against the side frame columns to generate damping forces. Since the spring force loading a friction wedge is a function of the spring group travel or vertical motion of the bolster, the spring force is greater when the car is loaded than when the car is empty. Thus, the damping force varies with the car weight.

The usual form of the friction wedges is illustrated diagrammatically in Figure 3. The wedge 52 has a column or friction surface 56 which frictionally engages the opposed surface 50 of the side frame column 44. In addition, it has a surface 48 sloping at an angle θ (in the order of 35 degrees relative to the column surface 56), which surface 48 frictionally engages the opposed sloping surface 54 of a pocket 42 formed in the bolster 40. The pocket 42 accommodates the wedge 52, which is urged upwardly between the side frame column and the bolster by the wedge spring 60, as shown. The primary motion during truck hunting is shown in Figure 4. The side frames 10 remain parallel with each other while forming the warp angle Ψ with the bolster 14.

Now referring particularly to Figures 3 and 5, open pockets 42 are formed at each end of the bolster 40 respectively opposite the columns 44 of the associated side frame. The opening into each pocket faces the adjacent side frame column. The pocket is provided with parallel opposed sides 46, and the opposite sides 58 of the wedge 52 are parallel thereto. In the square condition of the assembly the column surfaces of the wedges are in full face engagement with the faces of the side frame columns, and the sloping surfaces respectively of the bolster pockets and the wedges are in full face engagement. When the assembly warps, the bolster assumes a position such as that shown in Figure 6. This results in a binding between the corners of the wedges 52 and the faces 50 of the side frame columns. The resulting forces F_c, spaced at distance g, produce a restoring moment of gF_c. This moment increases as the angle Ψ increases, providing the wedges 52 remain secure in the bolster pockets 42. But certain movements of the wedges 52 within the bolster pockets 42 prevent the warp moment gF_c from becoming high enough to preclude truck hunting. These movements may be designated: (1) Horizontal Rotation of the Wedges (Figure 7); (2) Vertical Rotation of the Wedges (Figure 8); and (3) Unloading of the Wedges (Figure 9).

The first undesirable moment is rotation of the wedge 52 in the bolster pocket 42 about a horizontal axis, see Figure 7. The wedge 52 rotates in the direction shown and slips downwardly slightly in the bolster pocket 42. This permits the corner of the wedge designated "x" to move deeper into the bolster pocket, as a consequence of which the force F_c is reduced, which in turn reduces the warp moment, gF_c, and lowers the critical speed of truck hunting. The second undesirable movement is rotation of the wedge 52 in the bolster pocket 42 about a vertical axis, see Figure 8. The wedge 52 rotates in the direction shown. This motion frees the static friction between the bolster sloping surface 54 and the wedge 52, as a consequence of which the force F_c is reduced, which also reduces the warp moment gF_c. Finally, as shown in Figure 9, under certain conditions the wedge 26 may move downwardly, in the direction of the arrow, in the bolster pocket 38. Due to sloping surface 34 of the wedge 26, the wedge

26 may draw back from the side frame column 22, resulting in a rapid decrease in the force F_c, which again reduces the warp moment, gF_c.

Hawthorne states (column 4, line 51+) that a parametric study was made to assess the effect of the variables in the equations (a), (b), (c) and (d) set forth in column 4, lines 22-33) and has led to the following conclusions:

> (1) With regard to the coefficient of sliding friction μ: Referring to FIG. 15, although raising the value from 0.50 to 0.63 increases the ratio f for upward motion, the point where the slip region is entered does not change appreciably. By lowering the value to 0.10 the slip region is almost avoided. However, this is a marginal level for practical application, i.e., it does not provide a comfortable margin below the slip region. In the case of downward motion, lowering the value causes higher values of negative ratio f. If these reach the region between -0.8 and -1.0, the wedge may slip downward relative to the bolster.
>
> (2) With regard to wedge angle θ: Referring to FIG. 17, decreasing the wedge angle lowers the ratio f for upward motion, but it does not have an appreciable effect upon entry into the slip region. The ratio f for downward movement of the bolster is well behaved.
>
> (3) With regard to loaded car wedge spring force F_s : Referring to FIG. 18, for upward motion of the bolster increasing the wedge spring force lowers the maximum ratio f and changes entry into the slip region considerably. For downward motion, the system is well behaved.
>
> As a result of the parametric study it was concluded that merely varying a single parameter probably would not result in a practical system to secure the wedges against undesirable unloading during vertical motion, and that to achieve one purpose of this invention it probably would be necessary to vary one or more of the parameters studied. The study suggested reducing the wedge angle θ from 35 to 30 degrees, reducing the column coefficient of friction from 0.50 to the range of 0.25 to 0.30, and increasing the empty and loaded wedge spring force substantially.

To reduce horizontal and vertical rotation of the wedge 52 within the pocket 42 of the bolster 40 Hawthorne teaches (column 5, line 19+) to either (1) make a tight fit of the wedge within the booster pocket as shown in Figure 19; (2) make the bottom of the bolster pocket slope from each sidewall 46 of the bolster pocket toward the center of the pocket and toward the opening into the pocket as shown in Figure 20; (3) make the sloping surfaces of the bolster pocket and the wedge compound slopes as indicated in connection with Figure 20; (4) partition the pocket 42a by a vertically extending wall 66 into two separate sections 68 for respectively accommodating the sections of the wedges 52a and 52b as shown in Figure 22; (5) make the bolster pocket with sloping sections 64a that are flat across the width thereof and which merge along the length thereof to form a curvilinear crown 72 disposed midway between the opposed sidewalls of the bolster pocket as shown in Figures 23-24; and (6) form the wedge accommodating pockets 74 in the columns 78 of the side frame members while housing the wedge springs 80 in the pockets 74 as shown in Figures 25-26.

In summary, Hawthorne teaches (column 6, lines 31-37) that his invention entails one or more of the following: (1) reduced wedge angle θ; (2) reduced coefficient of friction μ; (3) increased snubber spring force F_s; and (4) wedge and bolster pocket arranged to preclude horizontal and vertical wedge rotation.

Ascertainment of the differences between the prior art and claim 1

After the scope and content of the prior art are determined, the differences between the prior art and the claims at issue are to be ascertained. Graham v. John Deere Co., 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966).

Based on our analysis and review of Hawthorne and claim 1, it is our opinion that the only difference is the relationship between the wedge angle θ and the wedge spring force P as defined by the two equations set forth in claim 1.[3] While Hawthorne does teach a wedge angle θ of 30° falling within the appellants preferred range of 28° to about 32°, Hawthorne does not teach that the wedge spring force P would be that defined by the two equations set forth in claim 1 when the wedge angle θ was 30° and the other variables in the two equations were determined from the rail car truck. Similarly, while Hawthorne does disclose a wedge spring force P of 3160 lbs. falling within the appellants preferred range of about 1350 lbs. to about 7300 lbs., Hawthorne does not teach that the wedge angle θ would be that defined by the two equations set forth in claim 1 when the wedge spring force was 3160 lbs. and the other variables in the two equations were determined from the rail car truck.

[3] The specification provides (e.g., page 1, first paragraph) that the present invention teaches the desired relationship between friction wedge angle, friction coefficient, wedge spring force and wedge width (as defined by the two equations set forth in claim 1) that provides a friction wedge that will simultaneously produce a very high to infinite warp friction moment with a moderate to low damping force.

In the rejection before us in this appeal, the examiner incorrectly ascertained (answer, p. 3) that Hawthorne disclosed "all the structural limitations of the instant claims." The examiner then stated that Hawthorne lacked "the specific simultaneous equations recited in the claims." Hawthorne does not disclose all the structural limitations of claim 1 since Hawthorne does not disclose any combination of wedge angle θ and wedge spring force P satisfying the two equations set forth in claim 1. That is, claim 1 requires a specific wedge angle θ with a corresponding specific wedge spring force P which together satisfy the two equations set forth in claim 1.

Determination of obviousness

In the rejection before us in this appeal, the examiner concluded (answer, p. 4) that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Hawthorne "to optimize the wedge angle and spring force to improve the damping characteristic as part of routine experimentation and optimization."

In our view, the examiner is correct that it would have been obvious at the time the invention was made to a person of ordinary skill in the art to optimize the wedge angle and spring force in Hawthorne's freight car truck assembly. However, there is no teachings or suggestion that optimizing the wedge angle and spring force as taught by

Hawthorne would result in freight car truck assembly coming within the scope of claim 1. In that regard, while Hawthorne may have suggested a freight car truck assembly having a wedge angle θ of 30° and a wedge spring force P of 3160 lbs., the examiner has not produced any rationale as to why that freight car truck assembly falls within the scope of claim 1. The mere fact that a wedge angle θ of 30° is within the range set forth in claim 2 and a wedge spring force P of 3160 lbs. is within the range set forth in claim 3 does not mean that when the wedge angle θ is 30° and the other variables in the two equations are determined from the rail car truck that the two equations determine that the spring force must be 3160 lbs. Additionally, the relationship between the wedge angle θ and the wedge spring force P as defined by the two equations set forth in claim 1 produces a new and unexpected result as explained in the briefs before us in this appeal which is different in kind and not merely in degree from the results suggested and taught by Hawthorne.

For the reasons set forth above, the decision of the examiner to reject claim 1, and claims 2 to 6 dependent thereon, under 35 U.S.C. § 103 is reversed.

CONCLUSION

To summarize, the decision of the examiner to reject claims 1 to 6 under 35 U.S.C. § 103 is reversed.

REVERSED

IRWIN CHARLES COHEN Administrative Patent Judge	)	
JOHN P. McQUADE Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JEFFREY V. NASE Administrative Patent Judge	)	

COOK, ALEX, MC FARRON, MANZO,
CUMMINGS & MEHLER, LTD.
SUITE 2850
200 WEST ADAMS STREET
CHICAGO, IL 60606

JVN/jg